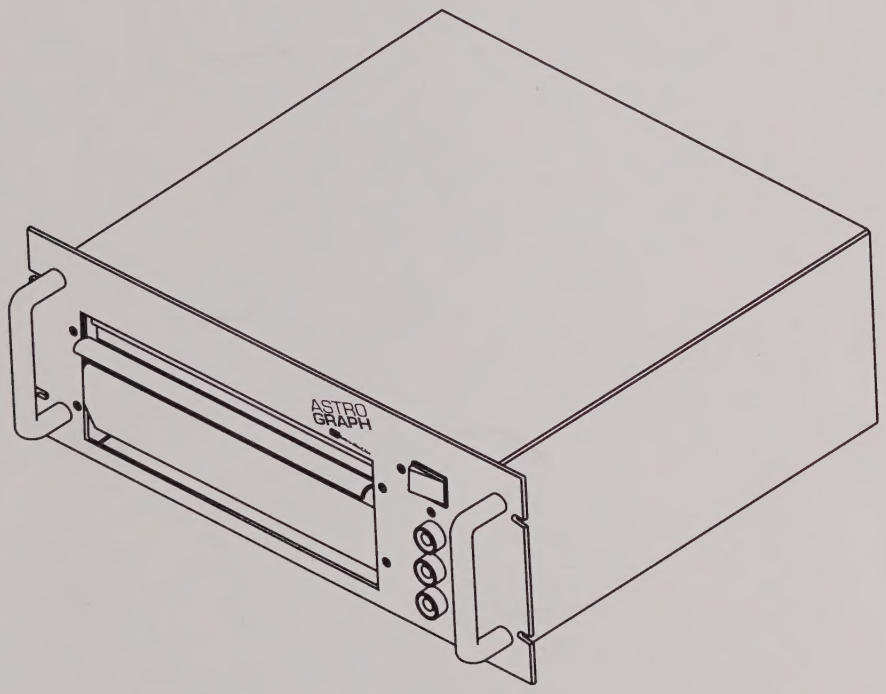
# ASTRO-GRAPH®
# Chart Recorder




## User Guide

22834-401
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Astro-Med,® Inc.

# ASTRO-GRAPH User Guide

part number 22834-401

Specifications are subject to change without notice.

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## Limited Warranty

Astro-Med warrants all portions of the ASTRO-GRAPH® against defects in materials or workmanship for a period of one year from the date of original purchase. If you discover a defect, Astro-Med will, at its option, repair or replace this product at no additional charge except as set forth below. Repair parts and replacement parts will be furnished on an exchange basis and will be either reconditioned or new. All replaced parts become the property of Astro-Med.

This warranty does not apply if the product has been damaged by accident, abuse, misuse, or misapplication; or has been modified without the written permission of Astro-Med.

To obtain warranty services, contact Astro-Med at: Astro-Med Industrial Part, West Warwick, Rhode Island, 02893. Call (401) 828-4000 for further information. Astro-Med is not responsible for your product if it is lost or damaged in transit.

Astro-Med makes no warranty, either express or implied, with respect to this product's fitness for a particular purpose.

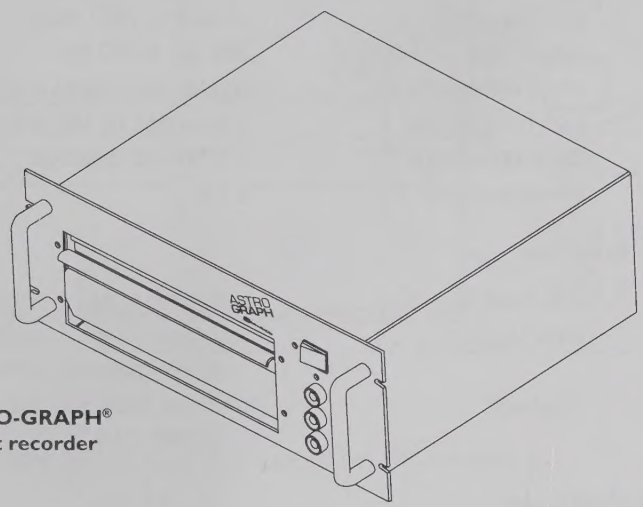
## Chart Recorder Identification Data

Congratulations. Your Astro-Med purchase is an investment in the finest of state-of-the-art printer technology. The information below lists the model number and serial number of your printer. If, for any reason, it should be necessary for you to contact Astro-Med regarding your purchase, please refer to the following:

serial number _____

# 1 The ASTRO-DAQ System and the ASTRO-GRAPH® chart recorder

The ASTRO-GRAPH® is a high resolution real-time chart recorder for optional use with the ASTRO-DAQ system.




**ASTRO-GRAPH®**
**chart recorder**

Astro-Med's ASTRO-DAQ data acquisition system establishes new standards for power and ease of use in collecting real-world signals. The ASTRO-DAQ System is a configurable set of hardware and software resources for the monitoring, acquisition, storage, and review of real-time signals using a personal computer (PC) running the Windows® 95 or Windows® for Workgroups operating system.

Unlike data acquisition systems which rely on the capabilities of the PC to collect waveform data, the ASTRO-DAQ System incorporates its own powerful sampling hardware, high-capacity hard-disk storage, and advanced digital signal processing (DSP) features. The ASTRO-DAQ System provides a single, seamless solution to the problem of acquiring real-world signals.

The core ASTRO-DAQ System consists of a multifunctional rack-mount or portable ASTRO-DAQ enclosure, a complement of signal conditioning modules, Astro-Med's proprietary ASTRO-LINK software, and a personal computer with an Ethernet interface card.

# ASTRO-GRAPH® specifications

## general

| | |
|---|---|
| recording method | direct thermal |
| printing width | 10 inches (250 mm) |
| resolution | 300 dpi x 300 dpi |
| chart drive | crystal referenced stepper motor |
| real-time speeds | 1 mm/min to 100 mm/sec (integer steps) |
| data logger rate | 1 to 60 sec intervals |
| speed accuracy | ± 2% |

## functions

| | |
|---|---|
| real-time recording | a maximum of 30 waveforms and 32 binary events |
| data logging | real-time numeric record of 30 channels in engineering units |
| playback | provides hardcopy for records acquired by the ASTRO-DAQ |

## chart paper

| | |
|---|---|
| format | Z-fold |
| page dimensions | 7.9 x 11 inches (200 mm x 280 mm) |
| capacity | 400 sheets per pack |

## controls

| | |
|---|---|
| Astro-Link | PC-based software with menu based control of all recorder functions including chart format |
| front panel | run/halt, paper advance, mark |

## power

| | |
|---|---|
| input voltage | 120VAC, 240VAC (50 / 60 Hz) |
| operating current | 120VAC - 3A maximum (fused) |

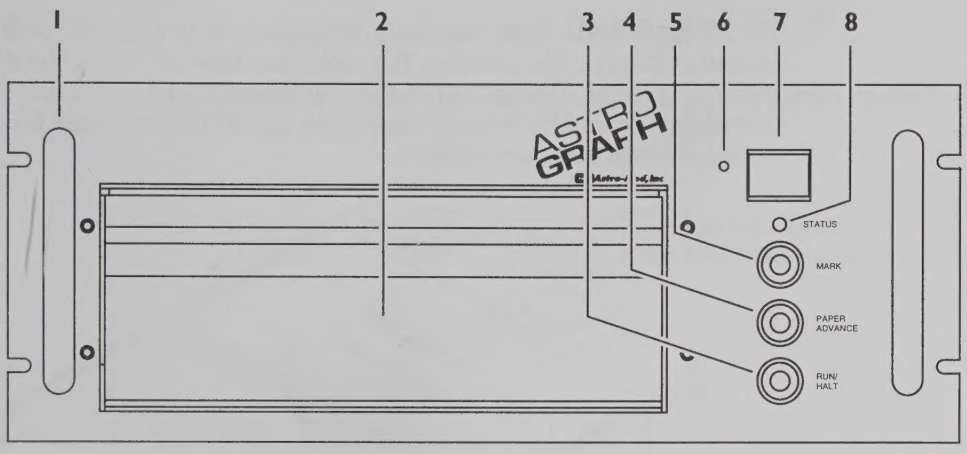
## physical

| | |
|---|---|
| package | rack mount |
| dimensions (w/o handles) | 7 x 19 x 15.4 in (17.8 x 48.2 x 39 cm) |
| weight | 20 lb (7.9 kg) |

## environmental

| | |
|---|---|
| operating temperature | 0 to 40 °C (32 to 104 °F) |
| operating humidity | 5% to 90% noncondensing |

# 3 ASTRO-GRAPH® front panel features




1 handles
used for carrying and positioning the recorder

2 paper-chamber door
accesses chart-paper supply compartment

3 RUN/HALT pushbutton
used to temporarily stop and resume printing

4 PAPER ADVANCE pushbutton
used to manually advance chart paper

5 MARK pushbutton
used to manually initiate printing of an event marker

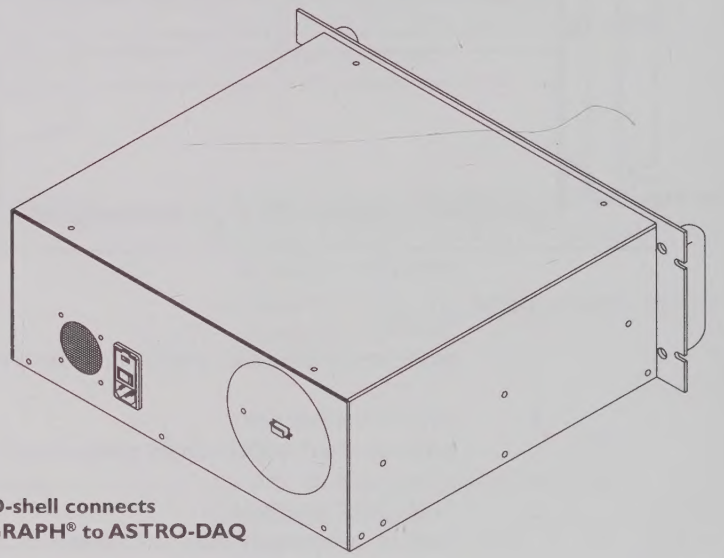
6 power on/off indicator light
when illuminated, indicates that power is active

7 power switch
turns recorder on and off

8 STATUS indicator light
flashes to indicate error conditions

## 4 Connecting an ASTRO-GRAPH® to an ASTRO-DAQ enclosure

The ASTRO-GRAPH® chart recorder directly connects to an ASTRO-DAQ using the communication's cable provided. The cable runs from the rear-panel ASTRO-GRAPH® D-shell connector labelled "ASTRO-DAQ" to the ASTRO-DAQ enclosure's rear-panel D-shell connector. This frees all slots in the ASTRO-DAQ enclosure for use with signal conditioner and accessory modules.



**D-shell connects ASTRO-GRAPH® to ASTRO-DAQ**

## 5 Loading an ASTRO-GRAPH® with Z-fold thermal paper

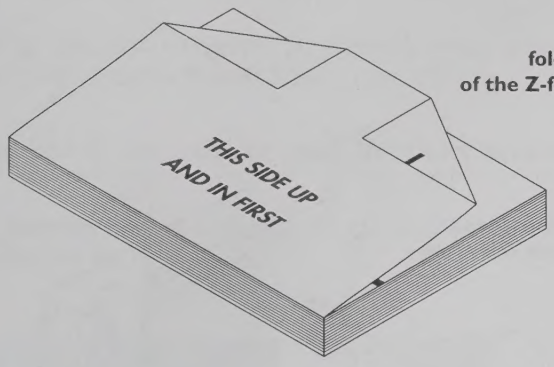
Astro-Med chart paper is manufactured by Astro-Med to exacting standards that eliminate the potential problems of residue buildup on thermal printheads and abrasion of thermal printheads. The printhead warranty may not be valid if other than Astro-Med or Astro-Med approved chart paper is used. For best results, always use Astro-Med thermal Z-fold chart paper exclusively.

1 Unwrap a pack of Z-fold thermal paper.

- To help orient the pack for placement into the ASTRO-GRAPH®, the first sheet of the pack is stamped "THIS SIDE UP AND IN FIRST."

2 Fold back the corners of the first sheet of the pack.

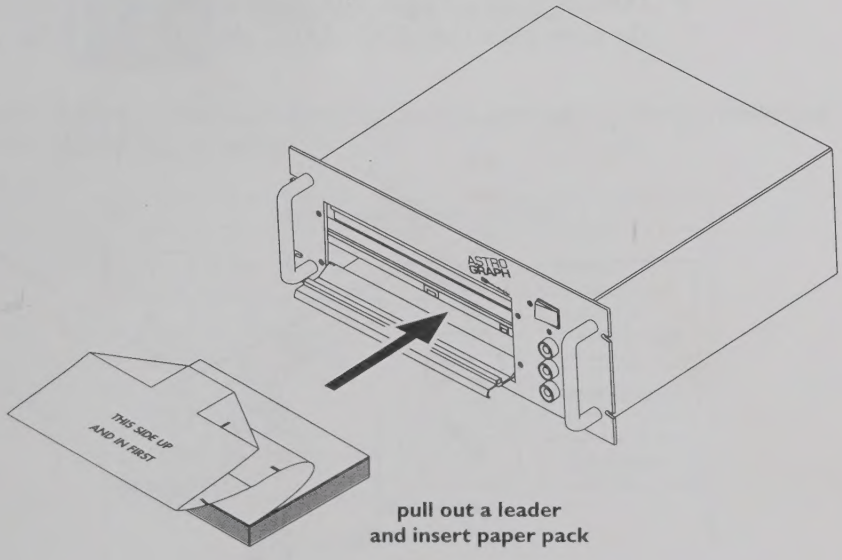
- This will help when the paper is threaded through the ASTRO-GRAPH® later in this procedure.




**fold the edges of the Z-fold thermal paper**

3 Completely open the ASTRO-GRAPH's® paper-chamber door.

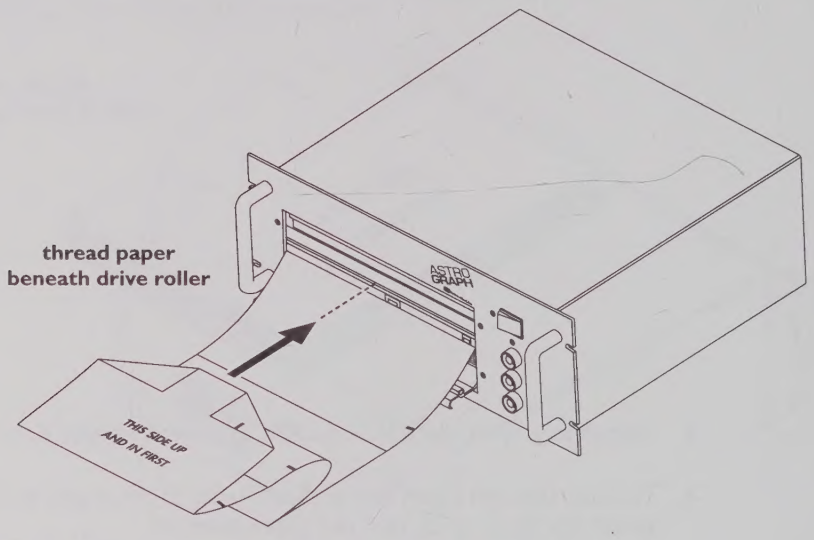
4 Pull out the first sheet and a short leader of the paper pack and fully insert the paper pack into the paper chamber.



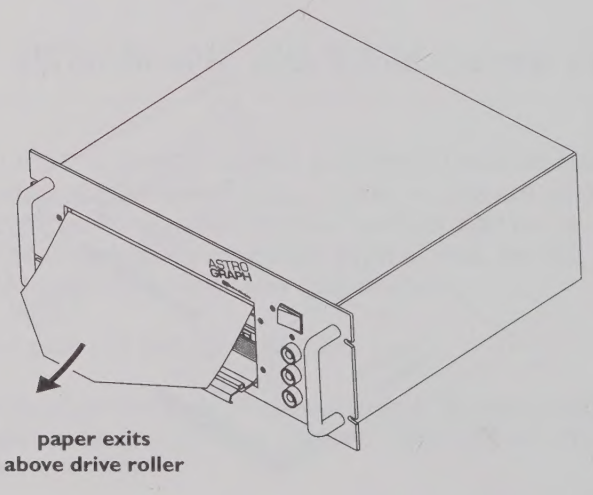

**pull out a leader and insert paper pack**

5 Thread the folded, first sheet of the paper pack beneath the drive roller.

- This is the space immediately above the paper chamber.




6 Carefully push the paper into and through the paper-feed channel until the paper exits the ASTRO-GRAPH® above the drive roller.




7 Close the paper-chamber door.

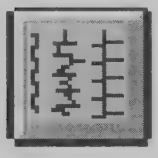
# 6 ASTRO-LINK setups for the ASTRO-GRAPH® chart recorder

When the ASTRO-GRAPH® has been connected to an ASTRO-DAQ enclosure and loaded with Astro-Med Z-fold thermal paper, ASTRO-LINK software is used to either:

- stream real-time data directly to the recorder using the menus available from the Chart Recorder Controls icon.
- setup data-capture records for playback by the recorder using menus available from the Record Management window.

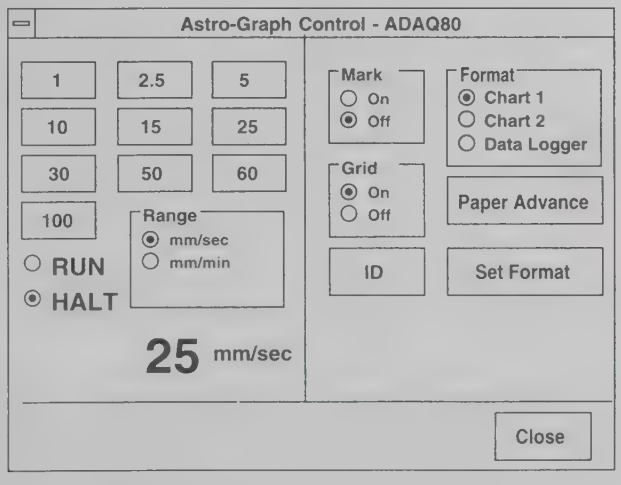
## Streaming data to the recorder using the Chart Recorder Control function

The Chart Recorder Control icon accesses the menus used to setup the ASTRO-GRAPH® to print real-time data.

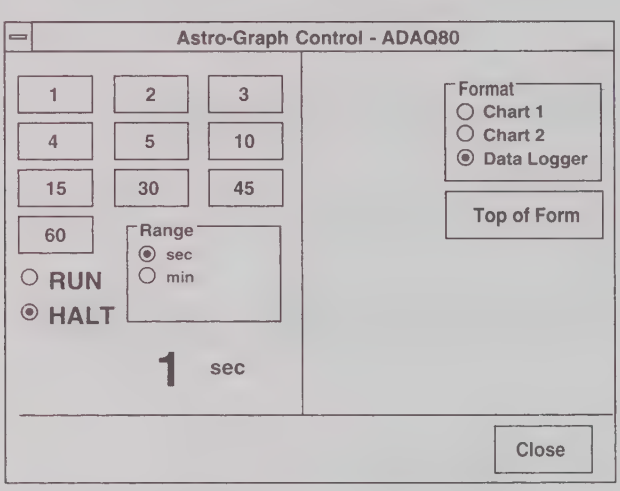


**tool bar detail:**
**Chart Recorder Controls icon**

Double clicking on the Chart Recorder Controls icon calls up the ASTRO-GRAPH® Control window shown below.



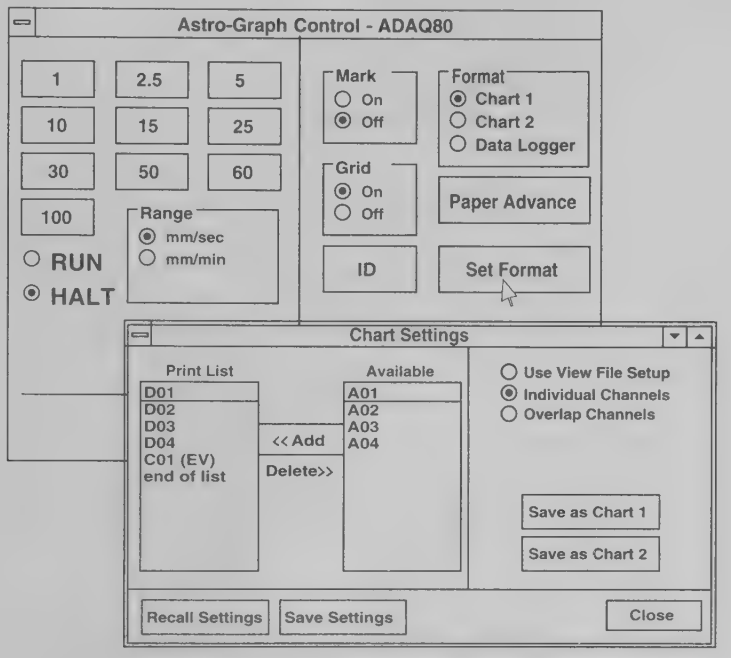
If "Data Logger" is selected in the Format field of the ASTRO-GRAPH® Control window, the window changes to reflect only those choices available when the data is to played out in datalogger format. The Data Logger format converts waveform data to tabular columns of calibrated, numeric engineering units that are user-specified. The ASTRO-GRAPH® Control window with the Data Logger format selected is shown below.




The control window is used to specify the following aspects of ASTRO-GRAPH® operation.

- select a chart speed (1, 2.5, 5, 10, 15, 25, 30, 50, 60, 100)
- select a speed range (mm/sec or mm/min)
- halt and resume printer operation (RUN/HALT)
- initiate an event marker (Mark)
- turn printing of the grid on and off (Grid)
- apply channel identification numbers to the waveforms on the chart (ID)
- select any of three preset chart formats (Format)
- advance the chart paper (Paper Advance)
- select a chart format other than the three preset chart formats (Set Format)

Clicking on the "Set Format" field calls up the Chart Settings window.




The Chart Settings window is a powerful tool for formatting charts.

- The Print List field shows the channels that have been selected to print and establishes the order in which the selected channels will be printed across the chart. When "Individual Channels" is selected, the first channel listed is printed at the top edge of the chart. The second channel is printed beneath the first. The third channel is printed beneath the second and so on to the bottom edge of the chart.

- The Print List is modified by clicking to select a channel and using the "<<Add" arrows to add channels from the "Available" list of channels. Channels are deleted from the Print List and returned to the list of available channels by selecting the channel and clicking on the "Delete>>" arrows.

- The "Use View File Setup" selection applies waveform setups previously created and saved in the Monitor or Scope Setup windows to the selected channels.

- The "Individual Channels" selection causes each channel to be printed individually on the chart without overlapping any other channel.

- The "Overlap Channels" selection causes all channels to overlap each other on the chart.

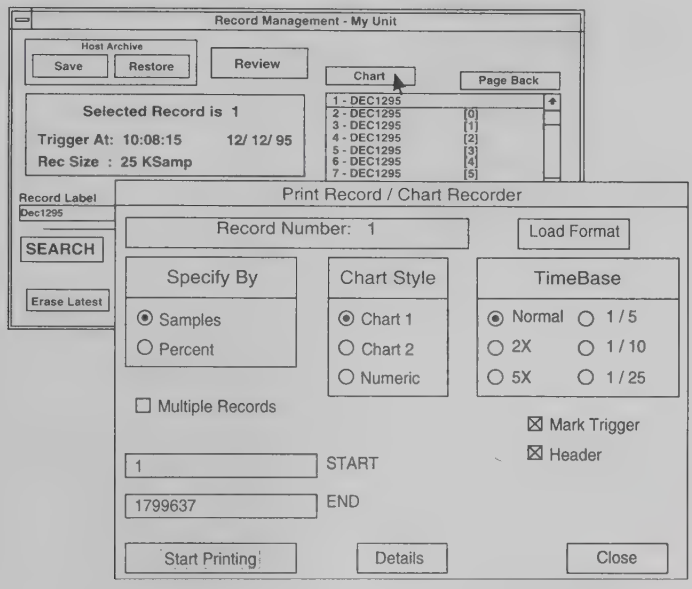
- The chart formats created in the Chart Settings window can be saved in either of two ways.
  - Clicking on the "Save as Chart 1" or "Save as Chart 2" buttons causes the currently defined chart format to be saved as the Chart 1 or Chart 2 selection available in the ASTRO-GRAPH® control window.
  - Clicking on the "Save Settings" button allows the currently defined chart format to be saved to disk for latter recall and use.
- Clicking on the "Recall Settings" button allows chart formats to be uploaded from disk for use.

## Setting up data-capture records for playback

The Record Management icon on the ASTRO-LINK tool bar accesses the Record Management window. One of the functions of the Record Management window is to setup the ASTRO-GRAPH® for the replay of data-capture records.

tool bar detail:
Record Management icon

Clicking on the "Chart" field calls up the Print Record / Chart Recorder window.




The Print Record / Chart Recorder window is used to specify the following aspects of data-capture record playback.

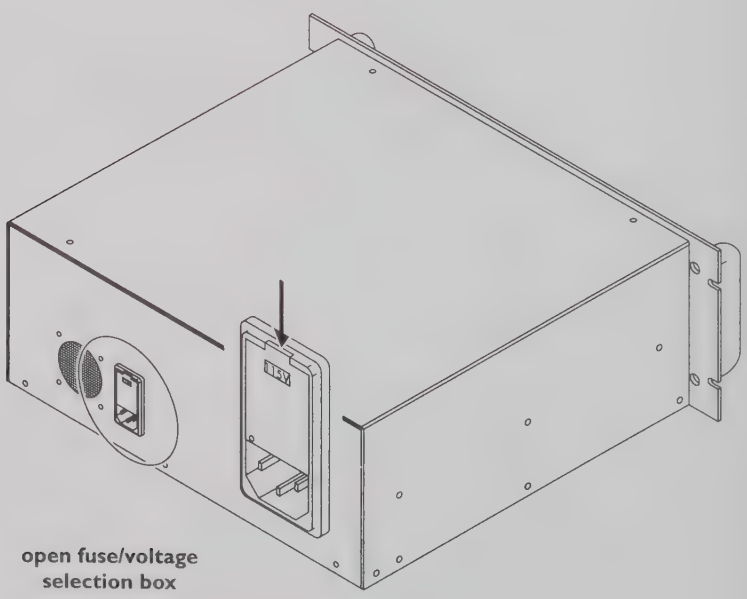
- The Record Number field is used to select a specific data-capture record for playback.
- The Specify By field is used to determine whether the playback will be printed as a numerical percentage of the selected record or as a specific range of data samples.
- The "Chart Style" field allows selection of either of two stored chart formats or numeric format.
- The "TimeBase" field allows selection of any of six timebase multipliers for the expansion or contraction of the playback.
- The "START" and "END" fields are used to select the part of the data-capture record to be replayed. The start and end parameters can be specified as percentages of the record or as sample points within the record. These will match the review cursor position when first opening the window.
- The "Load Format" field allows selection of stored chart formats other than "Chart 1," "Chart 2," and "Numeric" selections immediately available in the Chart Style field.

- The "Details" button brings up a message box that indicates the approximate number of pages and the amount of chart paper in centimeters required for the playback.
- The "Mark Trigger" selection box causes the trigger point of the playback to be identified by a straight line printed across the chart.
- The "Header" selection box causes a header to be printed at the beginning of the data-capture record playback. The header lists such record information as the sample rate, range, time stamp, and the acquiring ASTRO-DAQ.

## 7 Changing fuses

Before changing fuses or changing the line voltage setting ensure that the ASTRO-GRAPH® has been turned off and unplugged. Never change fuses or the line voltage setting while the recorder is plugged in and under power.

1. Locate the fuse/voltage selection box on the rear panel of the ASTRO-GRAPH®.
2. Using a small flat-head screw driver, pry open the fuse/voltage selection box.



open fuse/voltage selection box

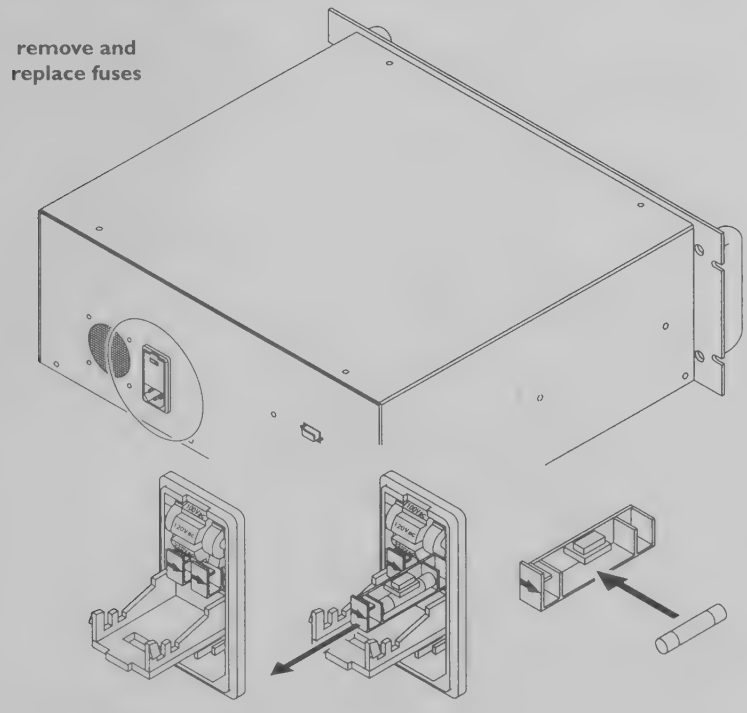
3 Locate the two individual fuse holders in the bottom part of the fuse/voltage selection box.

4 As necessary, remove each fuse holder and insert the desired replacement fuse.

- Ensure that the replacement fuses are of the correct type and rating.
- Operation at 120VAC requires two slow blow 3.15A fuses.
- Operation at 240VAC requires two slow blow 1.6A fuses.

**WARNING**

For continued protection against the risk of fire, replace fuses only with fuses of the same type and rating.



## 7 Changing fuses

5 Reinsert the fuse holders into the fuse/voltage selection box.

6 Close the fuse/voltage selection box cover.

## 8 Changing the line voltage setting

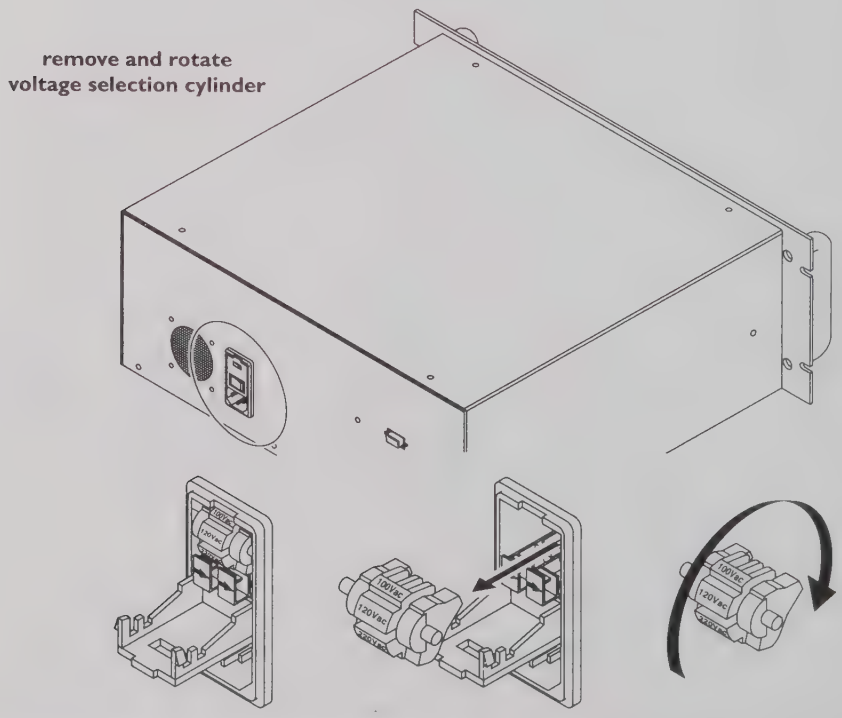
Before changing fuses or changing the line voltage setting ensure that the ASTRO-GRAPH® has been turned off and unplugged. Never change fuses or the line voltage setting while the recorder is plugged in and under power.

1 As shown in section 7, locate the fuse/voltage selection box on the rear panel of the ASTRO-GRAPH®.

2 Using a small flat-head screw driver, open the fuse/voltage selection box.

3 Locate and remove the voltage selection cylinder from the upper part of the fuse/voltage selection box.

4 Rotate the voltage selection cylinder to register the operating voltage you desire.



## 8 Changing the line voltage setting

5 Return the voltage selection cylinder to the fuse/voltage selection box.

6 Ensure that the installed fuses are of the correct type and rating for the operating line voltage that you have selected.

7 Close the fuse/voltage selection box cover.

## 9 ASTRO-GRAPH® error conditions and diagnostic tests

The STATUS LED will light when power is initially applied or the ASTRO-GRAPH® is reset by the ASTRO-DAQ. The STATUS LED will remain illuminated until the ASTRO-GRAPH® completes its internal power-on self-test and performs a self initialization. This should take less than 15 seconds.

**NOTE**

If the ASTROGRAPH is connected to an ASTRO-DAQ, the ASTRO-DAQ's power must be on or the ASTRO-GRAPH® will be held in a reset condition (the STATUS LED will remain illuminated).

When the power-on self-test / initialization is complete and no error conditions have been detected, the STATUS LED will turn off and remain off.

The ASTRO-GRAPH's® STATUS LED blinks on and off to indicate error conditions. The rate at which the STATUS LED blinks indicates the nature of the detected error.

- The ASTRO-GRAPH's® STATUS LED blinks on and off at a slow (1/2 second) interval to indicate either that the recorder has run out of chart paper or that the paper-chamber door is open. The blinking will continue indefinitely until chart paper is loaded or the paper-chamber door has been closed.

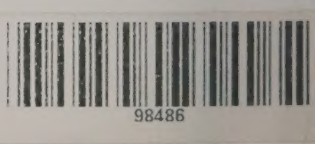
- The STATUS LED blinks on and off at a fast (1/10 second) interval to indicate that communication with the ASTRO-DAQ enclosure has been lost. The blinking will continue indefinitely until a link (valid command) is reestablished. Cable connections should be verified.

- The STATUS LED may blink at other rates to indicate internal hardware problems. If this condition should occur, contact Astro-Med customer service.

To have the ASTRO-GRAPH® perform a diagnostic self-test, recycle power to the chart recorder while holding down the RUN/HALT pushbutton. The recorder will enter a self-diagnostic mode and will print various patterns for visual inspection.

If power to the ASTRO-GRAPH® is recycled with both the RUN/HALT and EVENT pushbuttons held down at the same time, the chart recorder enters a test mode during which the motor is started at 25 mm/sec and a 255mm grid containing one full-scale triangle waveform is continuously printed. The chart can be visually inspected and the RUN/HALT pushbutton functions during the test mode.

- This self-test mode can only be performed if 1) the ASTRO-GRAPH® is not connected to the ASTRO-DAQ or 2) the ASTRO-GRAPH® is connected to an ASTRO-DAQ that has not been turned on.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